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ABSTRACT

Although the availability, economy, and independence of microcomputers have helped renew interest in computer assisted instruction (CAI) in English, at present there are six things hindering the use of CAI in college-level English: (1) lack of money, (2) educational conservatism, (3) current hardware deficiencies, (4) English techers' lack of interest in and knowledge of computers, (5) lack of knowledge of how people learn, and (6) scarcity of CAI software. But future developments will sweep away these hinderances. By 1992, most teachers and students will have, and will be writing on, microcomputers. Learning centers will have libraries of CAI software. Televised images created by word processing programs will dynamically demonstrate the value of revision. Routine tasks will be handled by computer, allowing teachers extra time to work with students. Microelectronic technology will produce major changes in printed media, and videodisc technology will provide amazing data storage and retrieval capability. Even farther in the future lie new directions in English instruction, such as automated paper grading and other, as yet undiscovered, uses of the computer. (JL)

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How Microcomputers May Redefine English Teaching

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Almost two hundred years ago the steam-powered machines of the Industrial Revolution began to intrude into pastoral America; that intrusion is central to Leo Marx's book on American literature and culture, The Machine and the Garden. Now, as another revolution gathers force, in what Alvin Toffler calls "the Third Wave," we are experiencing another intrusion, by another type of machine. This time the intrusion is into every corner of our society, even into our homes. The intruder is, of course, the microcomputer. If such prophets of the future as Toffler and Christopher Evans, author of The Micro Millennium, speak the truth, this new intruder will drastically change almost every aspect of our lives.

The ultimate basis of those changes is the most common substance on the earth's surface--sand, or silicon. And if we look more closely at the astounding core of most modern computers, we will see that William Blake was both prophetic and poetic when he wrote in "Auguries of Innocence" of seeing "the world in a grain of sand" and of holding "infinity in the palm of your hand, And eternity in an hour." For in the 1950's electrical engineers, physicists, and computer scientists developed ways to slice pieces of silicon into tiny thin chips, now most often about one-sixteenth of an inch (.19 mm.) square, or not much larger than a coarse grain of Blake's sand. In the early 1960's those scientists succeeded in etching such silicon chips to create "integrated circuits," the electrical equivalents to arrays of the much larger switching devices called transistors, which themselves had only recently replaced the even larger vacuum tubes of the first generation of electronic computers. Today it is common for sixty-four thousand or so tiny transistor imitators to occupy a single small chip, and chips holding a million switching devices are now being developed; some of these are also able to switch their electronic

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signals a billion or more times a second. Suddenly a world of information can indeed be stored in a small space. Relative time has changed, too, so that an hour really may seem an eternity, at least in terms of computer speed. After all, a device switching one billion times a second can switch 360 billion times in an hour; to put such speed in human terms, consider that a human heart averaging sixty beats a minute will take more than ten thousand years--certainly a long time, even if not eternity--to beat as many times.

Such miraculous chips made possible in 1971 the first so-called microprocessor: on a silicon chip smaller than a key on a pocket calculator was housed the complete Central Processing Unit (CPU) for a simple computer. With the addition of more circuitry and switching devices, especially memory portions for storing and passing on data, a microcomputer could be developed from a collection of electronic components that would fit on a fingernail. By 1975 this technology had resulted in the first typewriter-sized microcomputer, and only thirty years after the creation of the electronic computer, a revolution based on microelectronics had begun in earnest. That year there there were about 150,000 computers of every size in the United States, their average value about $300,000. This year such manufacturers as Apple and Tandy (Radio Shack) will each sell several hundred thousand microcomputers, with an average value around $2500. Now that Japanese and major U. S. companies such as IBM and Xerox have joined the competition for the microcomputer market, the prices of the machines will shrink at the same time that their power grows. Right now the English-made Sinclair ZX81 is debuting with a price of $99.95 in kit form, or $149.95 assembled. Another two hundred dollars buys a simple printer and 16,000 more bytes of memory. Early in 1982 price cutting was rampant on established machines, while at the same time new, extremely powerful microcomputers were being introduced, with abilities that just a few years ago were the domain of the largest, most expensive "mainframe" computers. One example is

Radio Shack's new Model 16, with up to 512,000 bytes of memory and two internal microprocessors, priced around $5,000.

These developments remind us of how prices fell on pocket calculators, whose most important components are also tiny silicon chips. Accompanying that price drop was the virtual extinction of the slide rule, in less than ten years. Will those specks of silicon, this time in microcomputers and other microelectronic-based devices, cause English teachers to go the way of the slide rule? How will microcomputers redefine our roles, especially as teachers of English composition and literature to college freshmen and sophomores? Let's examine microcomputers' effects on our profession now and in the near term, before turning speculative to conclude.

Right now microcomputers are mainly a curiosity for many of us. But some English teachers are beginning to use personally-owned ones for word processing chores, such as writing professional articles and books or for preparing class handouts. Properly equipped, a writer can be considerably more productive, and an editor friend reports that her journal is receiving a growing number of submissions typed by a computer-guided printer or typewriter (either the type face or the right-justified margin, as in a printed book, reveals the means). A few college teachers are also using microcomputers to ease administrative tasks: recording and averaging student grades, making objective or other tests, and the like. Ten years ago or so, computer-assisted instruction (CAI) in English, using terminals wired to a large computer, aroused a flurry of interest, but there are not a great many active survivors; some of those are Notre Dame University and those institutions which can afford the expensive PLATO system developed at the University of Illinois. However, the availability of microcomputers, relatively cheap in price and free of umbilical ties to a central comouter, has helped renew interest in CAI for English

again, as attested to by the appearance of numerous sessions, all well-attended, at professional meetings of English teachers. Right now, though, there are six principal factors hindering the use of CAI in college-level English, even at the remedial level, where we might expect to use less-complex materials developed for younger students.

The most immediate and obvious hindrance is money. With budget cuts and restraints affecting all of education, the funds are not available from either our own institutions or from government agencies to buy what we would like to try, even though most microcomputer equipment prices are easing now and seem likely to continue doing so.

The innate conservatism of education is another hindrance, for most of us cling to our time-honored ways of teaching, encouraged in part by the lack of time and the lassitude engendered by heavy teaching loads. Textbook publishers generally share in and encourage this conservatism. Their herd psychology causes them to stay together rather than to venture singly out, as we can easily confirm by visiting the various publishers' booths here or at any professional meeting and looking, for instance, for clones of the Harbrace College Handbook. Besides, who can be blamed for preferring to sell several hundred or a thousand $10 handbooks rather than one $200 or $300 set of CAI programs? Of course, some publishers are edging into this new area, among them Hayden, Houghton Mifflin, McGraw-Hill, Random House, SRA (owned by IBM), and Scott, Foresman (Classroom Computer News, July/August 1981, p. 37); however, since their efforts are concentrated on the much larger primary and secondary grade markets, almost none of their current CAI materials are suitable for our college-age and college-level students.

Another and perhaps unexpected limitation is the current hardware (the computer and its associated peripheral devices, such as disk drives and printers). Admittedly these limits are mostly temporary and technical, often based on cost, but they are real. For instance, microcomputer disk drives and memories sometimes cannot store all of the data we need or retrieve it as readily as we would like. Even worse, any current hardware can be unreliable, with Murphy's Law especially prevalent in peripherals; I have both a printer and a disk drive in the repair shop right now, and I can conjure up some dandy nightmares about the many things that can go wrong if a teacher decides to base an entire class session or project on the use of a microcomputer.

Another restriction is English teachers' general lack of interest in and knowledge of computers and their associated technology. Part of that lack stems from our natures, oriented to the verbal and the aesthetic rather than to the technical and scientific; we are more comfortable with the printed page than with the video screen and electronic circuitry. In addition, our salaries and our workloads combine to inhibit our personal attempts to learn more through appropriate courses and workshops.

The fifth curb on the use of CAI in English is our lack of knowledge about how people learn, and especially how they learn to write better; that ignorance means we mostly guess how best to teach, rather than know. Of course we now admit this deficiency, and much is being done to alleviate it, some with the aid of computers of various sizes. But we are just beginning, really, to grapple with the inherent complexity of English as a field of study, either as language, literature, composition, or in some combination; beyond that we have the problem of measuring the effects of our efforts. One thing is clear: the all-too-common "one prescription for all" approach is not efficient, humane, or pedagogically sound. I

use it myself, but only for lack of a better method. That lack drove me, with great reluctance, to begin in 1980 to devote more and more time to investigating the ability of microcomputers to individualize English instruction and thus to make it more effective. Now we fervently administer pre-tests and post-tests, yet aim our teaching efforts at the bulk of the students in a class. If we diagnose 50% of the class as afflicted with "Punctuation palsy" (inclined to shake commas into every place), another 30% as not even knowing what commas are, and the remainder as using them better than we do, our reaction normally will be to impose a common cure on 100% of the class. Everybody is ordered to read the appropriate handbook section (those who don't need to do so will probably even read it), all receive the same lecture, all are assigned the same exercises. And so it goes with grammar, spelling, reading assignments, writing topics: just as Grandma used to do, we make everybody line up and take a spoonful of tonic, sick or not. Of course I overstate, but from a basis of truth.

The last obstacle is the scarcity of CAI software for college-level English, nothing like the abundance of textbooks, for instance. Beyond that scarcity, any possible candidate for our use may have one or all of the following faults. (1) It will not work on the model or brand of microcomputer that we have (programs are written not just in languages, but in dialects of languages and for specific machines; a program written in BASIC for a TRS-80 Model III will not operate properly on an Apple, Atari, or Pet, or even on a TRS-80 Model II--and vice-versa). (2) Its cost exceeds our budget (a nine-module vocabulary improvement program, based on Greek and Latin roots, designed for middle grade and high school use and thus suitable for at least some of our students, costs about $270). (3) Such a program may be written on the wrong level for our students, seeming childish in its examples or its

language. (4) It contains factual errors (I have seen phrases labelled clauses and verbals misidentified). (5) It is pedagogically unsound, perhaps allowing the student to move through the program just by guessing repeatedly, or maybe accepting only one answer as correct when another is equally good. (6) It does not quite fit our class's needs yet cannot be modified by a knowledgeable teacher to do so. (7) It is little more than an electronic workbook, not really taking advantage of the computer's capabilities. (8) Its on-screen instructions or explanations are too complicated or too verbose. (9) Its response times are too long, so student interest wanders or disappears (some of you already know that working at a computer terminal causes a relative change in time comprehension; computers normally react so quickly to key touches and commands that before long a clock second begins to seem lengthy, while waiting ten or fifteen seconds seems an eternity). (10) It lacks proper support, possibly in the form of accompanying documentation (the "owner's guide" which explains how to load the program in the computer, how to make spare copies or get replacements, where to call or write if problems occur, and so forth). Clearly <u>caveat emptor</u> applies to CAI software.

These are all present realities, and they will retard the use of CAI in English beyond the high school level for the next few years. But in only a few more years most or even all of these hindrances will be swept aside by the power of the silicon chip. Cheaper and more powerful computers will invade most factories, offices, stores, and homes, as well as most classrooms. English teachers, for a variety of reasons, some selfish, some altruistic, some involuntary, will begin to learn more about microcomputers, just as many of you are doing today. Sometimes the push will come from above, sometimes from below. For example, one of my neighbors, a high school junior, has just begun to compose and print his English papers using his school's Apple II rather than writing them out by hand or on a typewriter. He and his classmates will virtually force us to use and to accept microcomputers as

adjuncts to learning, just as our colleagues in mathematics and the sciences came to accept the use of the calculator in their classrooms and laboratories. In fact, some of you may already have graded your first right-justified, printer-typed papers. Also in the next few years computers, both large and small, will help us to discover more about how people learn and thus how best to teach our subjects. At the same time, textbook and software publishers, hardware manufacturers, government agencies, and ambitious individuals will all be pushing forward with the development of pedagogically-sound CAI software, aided by programming languages, such as PILOT, which are specifically designed to ease the time and cost burden of authoring CAI programs.

Then what will happen, say around 1992 or so? By then most of us will have office microcomputers with printers, even if we have to buy them ourselves. Many of our students will be writing their essays on microcomputers, either at home or in institutional learning centers; colleges may even supply each entering student with a personal microcomputer, as Carnegie-Mellon University has already announced that it will do. Our learning centers will have libraries of CAI software, all much more sophisticated than today's tutorial and drill and practice versions; that instruction will be individualized as well as enhanced by graphics, color, and sound. In our classrooms, using images created by word processing programs on large television monitors or screens, we will dynamically demonstrate the value of revision. In fact, our students will often turn their writing in to us on disks rather than on paper. In fact, assuming voice-synthesizing and recognition technology continues to advance as it has recently, students may also speak their compositions directly into computer memories, rather than typing them into the machines; editing may also be done by voice commands.

At least some of the tedium of our jobs will be swept away by then, with the help of microelectronic devices, and we will also have computer programs to help us do much better jobs of diagnosing each student's reading and writing problems and of prescribing appropriate remedies. In addition, with many routine tasks handled more efficiently with the aid of our personal computers, we teachers should have extra time to work directly with those students who do not respond fully to computer-aided cures for their English ills.

Major changes,already underway, will occur in printed media. Microelectronic technology will allow the information of an unabridged dictionary or an encyclopedia to be stored in a space no larger than a deck of playing cards, with any "page" of information instantly accessible. At the same time, books with paper pages, along with printed magazines and newspapers, will virtually disappear, replaced by small disks or cartridges which we will insert into light-powered, book-sized microcomputers; touch or voice commands will change "pages" on flat electronic screens, create and record notes on key portions as desired, even adjust the size and darkness of letters on the screens for our viewing ease. At the same time the relative prices of such electronic "books" will fall, with production costs for popular books perhaps as low as 20 cents per copy.

Videodisc technology, perfected and coupled with the microcomputer, will provide amazing data storage and retrieval capability (already the contents of several sets of Encyclopaedia Brittannica can be stored on a single disc about the size of a long-playing phonograph record) and will display not only words but also their still and moving visual counterparts. For instance, a student reading Hamlet at a videodisc terminal will need merely to press a key or to speak a command to see any of the following appear instantly on the screen: a photograph of Elsinore Castle; a videotaped scene or scenes from a live production; a color representation

of the Globe's interior, with its details magnified wherever the student touches the screen. Such multi-media, instantly-accessible supplements will be available for each major work of literature.

What happens after this, say around 2001? I once expected to be retired by then, worn out by paper grading and repeated explanations of the comma splice and the sentence fragment. Now I'm less sure of my fate. Of course, we English teachers may be obsolete before then, like slide rules and printed books. (One hopeful fact is that the human brain contains about twelve billion neurons, each with 5600 to 60,000 dendrites for input and the same number for output; a neuron is much more sophisticated than the simple on-off switches of microprocessor chips--and of course all English teachers are equipped with the maximum number of neurons and dendrites. It will take quite a computer to replace one of us.) Another possibility is a different change of direction in the nature of the English teaching task, so that the postponement of retirement is not only possible but desirable. After all, optical scanners can already read the special characters on our checks and groceries, as well as several standard type faces, and there are encouraging experiments with the reading of handwriting. Most of us would enjoy teaching much more if we seldom or never had to read student papers, at least to note simple errors of grammar, mechanics, and spelling; programs exist today to handle such chores for users of some word processing packages.

Finally, only time can verify my description of the ways microcomputers may redefine English teaching in the next twenty years. Perhaps I am too farsighted--or perhaps my vision falls far short of a truly marvelous tomorrow: last March I heard a CAI authority assert that the computer has at least 25,000 undiscovered uses. Despite the discovery of a thousand or more of those uses since he spoke, I suspect his original number has grown, not shrunk. Today I can only

wish that I might successfully exhort some supernatural being, as Banquo did the witches, in his familiar words: "If you can look into the seeds of time/And say which grain will grow and which will not,/Speak then to me . . . ."

Hearing no answer, I can only believe that our future, as humans and as English teachers, is tied to tiny silicon "seeds of time."

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"How Microcomputers May Redefine English Teaching"

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Microcumputers are affecting every facet of our society, including college English teaching. While six main hindrances now inhibit the use of computer-assisted instruction (CAI) in freshman and sophomore English, by the decade's end most of those obstacles will be gone. By the early 1990's most English teachers as well as their students will be active users of microcomputers. About the same time, cheaper and more versatile electronic media will replace most printed books and periodicals. Likewise, videodisc technology, coupled to the microcomputer and providing truly amazing audio, graphics, and data storage and retrieval capabilities, will displace microcomputer-only CAI. By 2002 English teachers will be using their micromputers to ease most tedious "busy work"; ironically, this microelectronics revolution will also help humanize English teaching, as we will be able to diagnose individual students' reading and writing problems much more accurately and will have the means and time to provide truly personal help.